Summary of Results of Charbert Hydrogen Sulfide Monitoring September 3 - 23, 2004,
Aldehyde Sample from August 28, 2004, and
Volatile Organic Compound Sample from September 16, 2004

Hydrogen Sulfide

The Rhode Island Department of Environmental Management (RI DEM) is currently operating a continuous hydrogen sulfide monitor in Alton, Rhode Island, in a neighborhood north of the lagoons at the Charbert facility. The monitor was sited at 16 River Street, Alton, from June 7, 2004 to August 12, 2004. On August 12, 2004 it was moved, in response to a request from residents, to a nearby location at 7 Myrtle Street, Alton.

The Charbert facility began to aerate its active lagoon on July 27, 2004. Before aeration began, the monitors frequently recorded elevated hydrogen sulfide levels, particularly in the late night and early morning hours when calm wind conditions occur. On four occasions in the five weeks preceding the initiation of aeration, hydrogen sulfide levels in the neighborhood reached or exceeded 90 ppb. In contrast, during the month of August and the first two weeks of September, after aeration began, no concentrations above 10 ppb were detected.

Charbert reported to RI DEM that the motor failed on one of the two aerators in the active lagoon on Sunday, September 19th and that the aerator was not again operational until 6:30 PM on Tuesday, September 21st. Elevated concentrations of hydrogen sulfide were recorded during the early morning hours of Wednesday, September 22nd and Thursday, September 23rd, when wind conditions were calm. Concentrations up to 22 ppb were recorded between 6:12 and 9:26 AM on the 22nd and concentrations up to 31 ppb were recorded between 4:07 and 5:36 AM on the 23rd. The maximum one-hour concentrations on the two days were 18 ppb and 25 ppb, respectively, and the maximum 24-hour concentration during this period was 4 ppb.

It is likely that the failed aerator resulted in reduced oxygenation of the lagoon water and that the anaerobic conditions caused a build-up of hydrogen sulfide in the lagoon water. The hydrogen sulfide likely was then released into the air when the aerator again began to operate. During the periods when the concentrations were elevated, the air levels were in the range classified by the Department of Health as nuisance levels. Hydrogen sulfide levels recorded to date at various locations in the Alton area are listed in Table I below.

Table I Maximum Hydrogen Sulfide Levels

Monitor	Date	Maximum 15-minute Reading	Maximum 1-hour Level Nuisance Air Quality >2 - <100 ppb Moderate Air Quality 100 - <1000 ppb	Maximum 24-hour Level Nuisance Air Quality >2 - < 30 ppb Moderate Air Quality 30 - <70 ppb
Myrtle Street	8/12 – 8/24/04	5 ppb	3 ppb	0.6 ppb
	8/25 – 8/30/04	4 ppb	2 ppb	0.5 ppb
	8/31 – 9/3/04	10 ppb	3 ppb	0.5 ppb
	9/4 – 9/10/04	4 ppb	2 ppb	0.4 ppb
	9/11 – 9/17/04	3 ppb	2 ppb	0.8 ppb
	9/18–9/23/04***	31 ppb	25 ppb	4 ppb
River Street	6/7– 6/14/04	78 ppb	49 ppb	7 ppb
	6/15 – 6/21/04	44 ppb	29 ppb	7 ppb
	6/21 – 6/28/04	90 ppb*	79 ppb*	15 ppb
	6/28 – 7/7/04	90 ppb*	78 ppb*	16 ppb
	7/7 – 7/12/04	45 ppb	33 ppb	7 ppb
	7/16 – 7/26/04	90 ppb*	86 ppb*	16 ppb
	7/27**– 8/3/04	29 ppb	23 ppb	3 ppb
	8/3 – 8/9/04	9 ppb	5 ppb	0.4 ppb
	8/10 – 8/12/04	2 ppb	2 ppb	0.5 ppb
Woodville-Alton Rd	5/13 – 6/7/04	6 ppb	2 ppb	0.2 ppb
	6/6 – 6/14/04	27 ppb	19 ppb	3 ppb
	6/15 – 6/21/04	10 ppb	5 ppb	1 ppb
	6/22 – 6/28/04	16 ppb	13 ppb	2 ppb
	6/28 – 7/7/04	39 ppb	28 ppb	2 ppb
	7/7 – 7/15/04	12 ppb	7 ppb	1 ppb

*Due to the limitations of the instrumentation, concentrations during these periods may have been higher than these values.

**Aerators began operation on 7/27/04.

***One aerator did not operate between 9/19/04 and 9/21/04.

Volatile Organic Compound Samples

A series of evacuated canister air samples have been collected in the Alton neighborhood since June 2004 and analyzed for volatile organic compounds (VOCs). The results of those samples, including a sample taken on September 16th, are displayed in Table II. The September 16th sample, like the sample taken on September 1st, was taken by a neighborhood resident. The September 16th sample was taken for a 30-minute period beginning at 7:10 PM in the backyard of 7 Myrtle Ave. The resident who took the sample reported the presence of a burning oil/gasoline odor during the sample period.

As with the previous samples, the VOC levels in the September 16th sample were generally consistent with background levels of these substances commonly seen in non-urban areas of the State. The only substance that was present in substantially higher levels in the September 16th sample than in previous samples and in background levels was ethyl acetate.

Ethyl acetate is a solvent used in lacquers, paints, resins, coatings, cleaners and perfumes. Its chemical formula is $CH_3COOC_2H_5$ and its CAS identification number is 141-78-6. According to the US Occupation Safety and Health Administration (OSHA), ethyl acetate has a pleasant, fruity odor. However, since it was present in this sample in a concentration of 0.24 ppb and the odor threshold is, according to OSHA, 3.9 ppm (3,900 ppb), that odor would not be apparent in the air sample. Two states, New York and Michigan, have derived guideline health benchmarks for ethyl acetate; those levels are 940 and 890 ppb, respectively. The concentration measured is more than 3,700 times lower than those health benchmarks, and therefore is unlikely to be associated with health effects.

Residents have since taken two additional VOC samples. The results of those samples will be released when they are available.

Aldehyde Samples

In a VOC sample taken on July 30, 2004, the laboratory noted the presence of three aldehyde compounds, butyraldehyde (butanal), valeraldehyde (pentanal) and hexylaldehyde (hexanal), that are not frequently seen in significant levels in VOC samples in Rhode Island. The VOC canister sampling method is not the appropriate method for measuring those substances, and, therefore, the concentrations of those substances could not be accurately quantified. In order to attempt to determine whether unusual levels of those substances are present in the Alton air, RI DEM collected a 24-hour air sample on Myrtle Street on Saturday, August 28th using the recommended method for sampling for aldehydes, EPA Method TO-11a. For comparison purposes, a concurrent sample was taken at the RI DEM monitoring site in East Providence.

The Rhode Island laboratory commonly uses the TO-11a method to analyze only for formaldehyde, acetaldehyde and acetone and is not set up to quantify other aldehyde concentrations using that method. Therefore, the August 28th samples were sent to the New York Department of Conservation (NY DEC) laboratory to be analyzed for a more extensive list of aldehydes, including the three tentatively identified in the July 30th VOC sample.

The results of the aldehyde analyses are displayed in Table III. Aldehyde levels measured in Alton were similar to those in the East Providence sample and are similar to those seen in other states. The State of Michigan has derived a health benchmark screening level for butyraldehyde of 2.4 ppb for a 24-hour period and the EPA's Office of Pollution Prevention and Toxics lists an odor threshold of 4.6 ppb for that substance. Since both of those values are considerably higher than the 0.154 ppb concentration of that substance measured in Alton, it is unlikely that the butyraldehyde levels measured would result in either an odor or health effects.

For valeraldehyde, Michigan's screening level health benchmark is 1,000 ppb as an 8-hour average and the New York health benchmark is 120 ppb as an annual average, as compared to the Alton result of 0.074 ppb. No health benchmarks have been derived for hexanal. Like butyraldehyde, both of these substances were present in levels similar to those in East Providence and well within the range of the levels commonly seen in other states.

The samples were taken on a day that residents reported an odor in the neighborhood, although the residents have reported that odors were stronger on other days. Note, however, that significant aldehyde peaks have not been seen in any of the VOC samples taken after July 30th, including those taken by residents when an odor was present. Since the residents report that the odor persists, there is no reason at this time to believe that the aldehydes are causing the odor.

For more information about sampling results, contact Barbara Morin at 222-4700, ext. 7012.

Table II	South End	South End	16	1	7	Cancer	Noncancer
Alton VOC samples	**River St.**	**Myrtle St.**	**River St.**	**Poplar Av**	**Myrtle Av**	**1/million**	**Benchmark**
	06/24/04	**06/24/04**	**07/30/04**	**09/01/04**	**09/16/04**	**Benchmark**	
Name	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**
ethylene	1.10	0.98	0.30	0.65	0.69		
acetylene	0.94	2.42	0.32	0.56	0.70		
ethane	2.06	2.12	2.56	1.23	1.25		
propene	0.24	0.21	0.17	0.22	0.20		2000
propane	3.71	3.27	0.96	0.98	1.05		
chloromethane	0.73	0.67	0.59	0.60	0.67		40
isobutane	0.30	0.29	0.09	0.28	0.12		
1-butene	0.14	0.12	0.15	0.17	0.31		
1,3-butadiene	0.02	0.03	0.01	0.02	0.02	0.01	2
butane	0.56	0.52	0.13	0.71	0.28		
acetonitrile	0.04	0.00	0.14	0.14	0.07		40
acetone	9.36	0.85	6.71	5.06	1.78		10000
isopentane	1.17	1.02	0.04	1.70	0.80		
pentane	0.41	0.43	0.10	0.61	0.27		
carbon disulfide	0.02	0.01	0.005	0.009	0.02		200
Methyl-t-butyl-ether	0.58	0.63	0.05	1.31	0.89		800
2-methylpentane	0.33	0.29	0.04	0.49	0.32		
methyl ethyl ketone	0.39	0.04	0.38	0.38	0.13		300
3-methylpentane	0.22	0.17	0.01	0.24	0.17		
n-hexane	0.23	0.20	0.000	0.30	0.22		60
1,1,1-trichloroethane	0.02	0.02	0.003	0.02	0.02		200
benzene	0.22	0.19	0.05	0.23	0.17	0.04	9
carbon tetrachloride	0.12	0.09	0.09	0.09	0.08	0.01	6
n-heptane	0.07	0.07	0.00	0.13	0.09		
toluene	0.67	0.66	0.04	0.80	0.79		100
ethylbenzene	0.09	0.11	0.00	0.13	0.13		200
p & m xylenes	0.24	0.28	0.008	0.39	0.36		20
o-xylene	0.10	0.10	0.00	0.14	0.14		20
a-pinene	0.92	0.96	0.04	0.33	0.21		
1,2,4-trimethylbenzene	0.09	0.10	0.02	0.14	0.17		
trans-2-butene	0.05	0.04	0.01	0.07	0.03		
cis-2-butene	0.05	0.05	0.008	0.07	0.03		
1-pentene	0.05	0.05	0.05	0.08	0.15		
isoprene	0.34	0.55	4.59	3.92	1.55		
trans-2-pentene	0.07	0.10	0.00	0.14	0.06		
cis-2-pentene	0.03	0.05	0.00	0.06	0.03		
dichloromethane	0.11	0.09	0.05	0.06	0.06	0.6	100
2,2-dimethylbutane	0.04	0.05	0.00	0.05	0.02		
cyclopentane	0.04	0.04	0.00	0.08	0.04		
2,3-dimethylbutane	0.11	0.12	0.00	0.15	0.11		
chloroform	0.04	0.04	0.00	0.02	0.02	0.008	60
methylcyclopentane	0.14	0.12	0.00	0.20	0.15		
2,4-dimethylpentane	0.05	0.04	0.00	0.08	0.07		
cyclohexane	0.05	0.05	0.00	0.07	0.05		
2-methylhexane	0.10	0.09	0.00	0.11	0.09		
2,3-dimethylpentane	0.06	0.06	0.00	0.12	0.07		
3-methylhexane	0.11	0.10	0.00	0.15	0.12		
trichloroethylene	0.003	0.000	0.000	0.007	0.007	0.09	100
	South End	**South End**	**16**	**1**	**7**		
Charbert samples	**River St.**	**Myrtle St.**	**River St.**	**Poplar Av**	**Myrtle Av**	**Cancer**	**Noncancer**
	6/24/2004	**6/24/2004**	**07/30/04**	**09/01/04**	**38246.00**	**1/million**	**Benchmark**
Name	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**	**ppb**
2,2,4-trimethylpentane	0.16	0.15	0.01	0.23	0.30		200
methylcyclohexane	0.06	0.05	0.00	0.05	0.05		
2,3,4-trimethylpentane	0.05	0.05	0.00	0.08	0.12		

Table II	South End	South End	16	1	7	Cancer	Noncancer
Alton VOC samples	**River St.**	**Myrtle St.**	**River St.**	**Poplar Av**	**Myrtle Av**	**1/million**	**Benchmark**
2-methylheptane	0.03	0.02	0.00	0.05	0.04		
3-methylheptane	0.03	0.02	0.00	0.06	0.05		
n-octane	0.04	0.03	0.00	0.04	0.04		
tetrachloroethylene	0.04	0.03	0.00	0.03	0.02	0.03	5
styrene	0.01	0.02	0.00	0.10	0.01		200
n-nonane	0.03	0.02	0.00	0.02	0.02		
isopropylbenzene	0.009	0.009	0.00	0.01	0.009		
n-propylbenzene	0.02	0.03	0.00	0.03	0.04		
m-ethyltoluene	0.06	0.06	0.002	0.08	0.09		
p-ethyltoluene	0.04	0.04	0.00	0.04	0.04		
1,3,5-trimethylbenzene	0.02	0.02	0.00	0.03	0.04		
o-ethyltoluene	0.03	0.03	0.00	0.03	0.04		
n-decane	0.03	0.02	0.00	0.02	0.02		
p-dichlorobenzene	0.01	0.008	0.00	0.006	0.004	0.02	100
1,2,3-trimethylbenzene	0.02	0.02	0.00	0.03	0.04		
m-diethylbenzene	0.004	0.000	0.00	0.005	0.000		
p-diethylbenzene	0.01	0.02	0.00	0.02	0.04		
n-undecane	0.03	0.03	0.02	0.02	0.05		
dodecane	0.03	0.03	0.02	0.00	0.01		
vinyl chloride	0.000	0.000	0.000	0.000	0.000	0.09	40
acrylonitrile	0.000	0.000	0.00	0.000	0.000	0.005	0.9
1,1-dichloroethene	0.000	0.000	0.00	0.000	0.000	0.005	50
1,1-dichloroethane	0.000	0.000	0.00	0.000	0.000	0.16	
ethyl acetate	0.000	0.000	0.00	0.02	0.24		890
1,2-dichloroethane	0.000	0.000	0.00	0.000	0.000	0.01	100
1,2-dichloropropane	0.000	0.000	0.00	0.000	0.000	0.02	0.9
cis-1,3-dichloropropene	0.000	0.000	0.00	0.000	0.000	0.04	4
trans-1,3-dichloropropene	0.000	0.000	0.00	0.000	0.000	0.04	4
1,2-dibromoethane	0.000	0.000	0.00	0.000	0.000	0.00065	0.8
chlorobenzene	0.000	0.000	0.00	0.000	0.000		200
1,1,2,2-tetrachloroethane	0.000	0.000	0.00	0.000	0.000	0.003	400
TNMOC ppbC	156	134	103	152	127		
*Note: Total NonMethane Organic Compounds (TNMOC) is in units of							
parts per billion carbon (ppbC)							

Table III

Aldehyde Results August 28, 2004 Samples	**Alton**	**E. Providence**
	ppb	**ppb**
Target Substances		
n-butyraldehyde	0.154	0.138
valeraldehyde	0.074	0.042
hexylaldehdye	0.077	0.113
Other Substances Identified		
formaldehyde	3.185	5.300
acetaldehyde	1.283	2.163
acetone	1.128	2.327
acrolein	0.031	0.048
propionaldehyde	0.188	0.246
crotonaldehyde	0.104	0.188
2-butanone	0.300	0.435
methacrolein	0.147	0.367
benzaldehyde	0.082	0.087
m-tolualdehyde	0.023	0.013